



Conceptual Models of the Mission Space:

Communicating Warfighter Requirements to Systems Engineers

Jack Sheehan (ARL:UT)
DMSO Data Engineer
703-998-0660 x448
jsheehan @msis.dmso.mil

Bruce Harris (DRC)
DMSO CMMS User Advocate
978-475-9090 x1878
harris.bruce@drc.com

Outline

- What is the Problem to be Solved
 - Joint Vision 2010 Context
 - Simulation Development Thread
 - The Nature of the Problems and Solutions
 - Training Example
 - Joint Training System (JTS) Context
 - JSEAD Mission Thread
 - Warfighter-to-Engineer Communication
 - Test & Evaluation Example
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Emerging Operational Concepts

Joint Vision 2010

Dominant Maneuver

Precision Engagement

Technological Innovations



Coalition Partners

Control of 1



Focused Logistics

Full-Dimensional Protection



Massed

Communicating Mission Space Knowledge: One Way

• Warfighter: FO calls in mission. FA Btty fires it.

• Developer: What's an FO?

• Warfighter: Forward Observer -- the guy

with the

grunts that has a DMD.

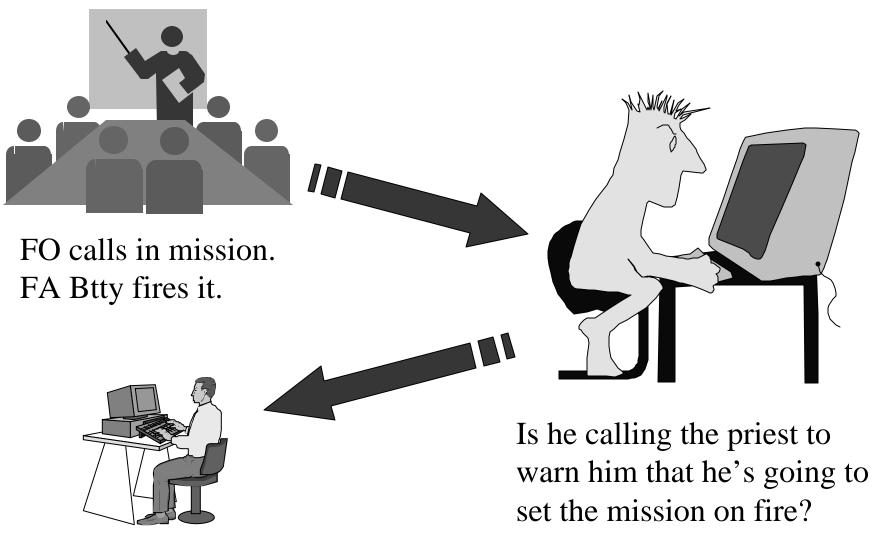
• Developer: What's a DMD?

• Warfighter: Digital Message Device -- the FO uses

it to send in Fire Requests to the FIST.

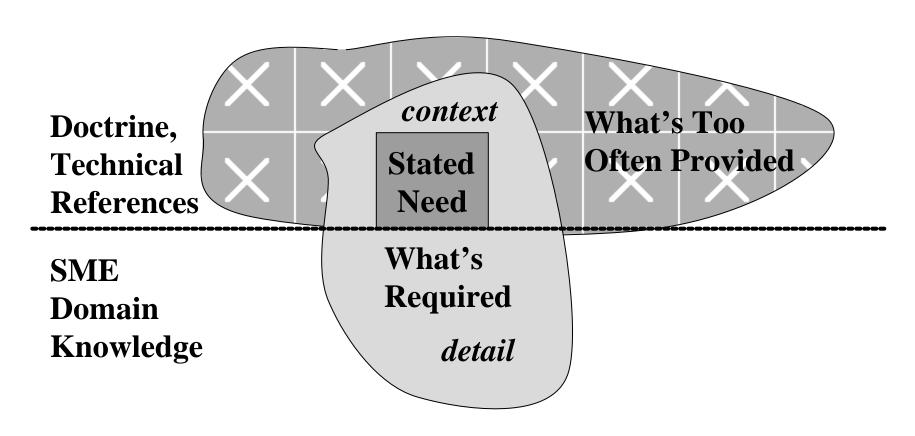
• Developer: What's a FIST?

Ambiguity is an Issue



But why is the church burning?

Available Information: Too Much and Too Little



CMMS Problem Summary

- Simulation/federation developers invest considerable resources in acquiring knowledge about the real world to be synthesized.
- Key problems are:
 - authoritative information is <u>not</u> readily <u>available</u>.
 - the mission space knowledge acquired is <u>incomplete</u> for simulation development or <u>ambiguous</u> to the developer.
 - knowledge acquired (at considerable expense) is <u>not retained</u>
 for future use (fostering unnecessary duplication).
- If a functional description of an entity (or process) is not available to the developer, odds are that the entity (or process) will not be represented (or correctly represented) in the simulation.

Perspectives

- The Warfighter cares about <u>Credibilty</u>.
- The Developer cares about <u>Completeness</u>.
- The Program Manager cares about <u>Cost</u>.

Achieving all three requires a focus on Composability

Structuring Mission Space Information is Kev



1. A Military Operation is composed of various discrete and continuous processes, entities, environmental factors, interactions and relationships.

REAL WORLD

2. Information is collected that specifies "business rules," and relationships between entities, actions, tasks, interactions, etc. This results in a Mission Space Model.

3. Synthetic Representation Specifications for algorithms and data defining processes, entities, and environmental factors.

4. Software is selected (designed) per MSM and SR spec's for inclusion (implementation) as a Simulation Component.

CREATE TABLE JFAC.TCHR (ATO, Forces, Target UNIQUE, NAME CHAR{40}, Sortie __Number[7] NOT NULL, PRIMARY KEY {Target_set})





SYNTHETIC WORLD

Conceptual Models of the Mission Space

Simulation Development Process

Real World CMMS Front End Analysis Implementation

Implementation Independent

Implementation Dependent

CMMS is the Bridge Between the Warfighter and Engineer

• Conceptual Models: consistent description of real world military operations

• Technical Framework: standards for knowledge capture and integration

• Common Repository: DBMS for management and release

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JSEAD Exercise under the JEMP-III Joint Training System (JTS)

IMPROVE

JOINT FORCE

READINESS

Requirements

 Derived From National Military Strategy and Assigned Missions

Based on Commander's Intent & Joint Doctrine/JTTP

Stated in Terms Of Joint Mission Essential Tasks; Conditions; and Joint Standards

Plans

Driven by Mission
 Requirements, Training
 Audience and Tools

And Resident Training Plan
And Resident Sches Objectives
To Meet, Requirements
Guidance Provided and Sche

Guidance Provided and Schedules Deconflicted by the CJCS

Assessments

- Commander Ass
 - **♦** Training Effect veness
 - **◆ Joint Readiness**

Identify Ability to Meet Joint Standards:

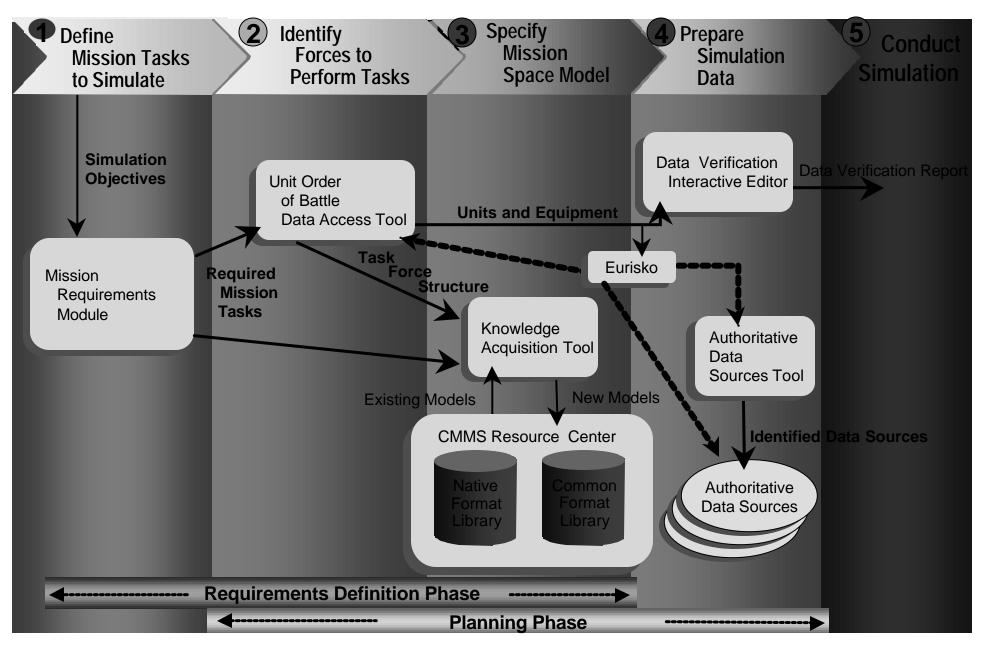
Strengths/Deficiencies in Doctrine, Organization, Training, Materiel & Education

Execution

 Joint Training Conducted by CJCS & Combatant Commands

Commanders Evaluate Each Event
Common Tasks Addressed by USACOM
Supported by Joint Warfighting Center

Int Suppression of Enemy Air Defenses



JOINT TRAINING SYSTEM

IMPROVE

Requirements

 Derived From National Military Strategy and Assigned Missions

Based on Commander's Intent & Joint Doctrine/JTTP
Stated in Terms Of Joint
Mission Essential Tasks;
Conditions; and Joint Standards

Plans

• Driven by Mission Requirements and Training Audience

Creates Joint Training Plan
And Establishes Objectives
To Meet Requirements
Guidance Provided and Schedules
Deconflicted by the CJCS

Assessments — JOINT FORCE READINESS

- Commander Assesses:
 - Training Effectiveness
 - Joint Readiness

Identify Ability to Meet Joint Standards: Strengths/Deficiencies in Doctrine Organization, Training, Materiel & Education

Execution

 Joint Training Conducted by CJCS & Combatant Commands

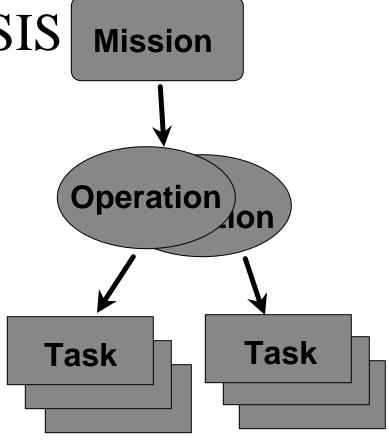
Commanders Evaluate Each Event Common Tasks Addressed by Joint Force Integrators

CONDUCT MISSION

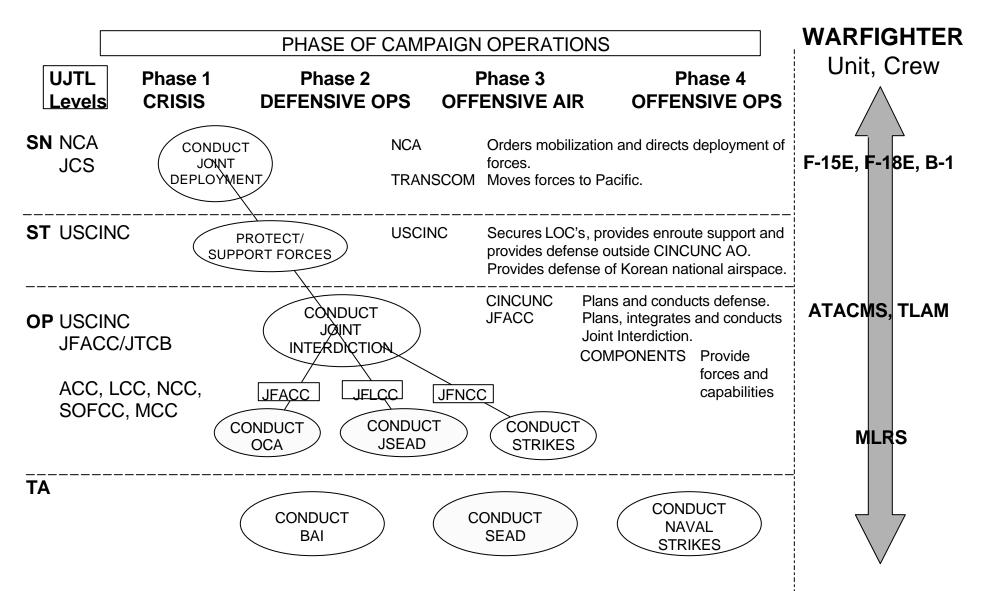
• Mission is assigned to CNC:YSIS Concept of operations may include a number of operations.

• Operations, the building blocks of mission planning, are comprised of multiple tasks.

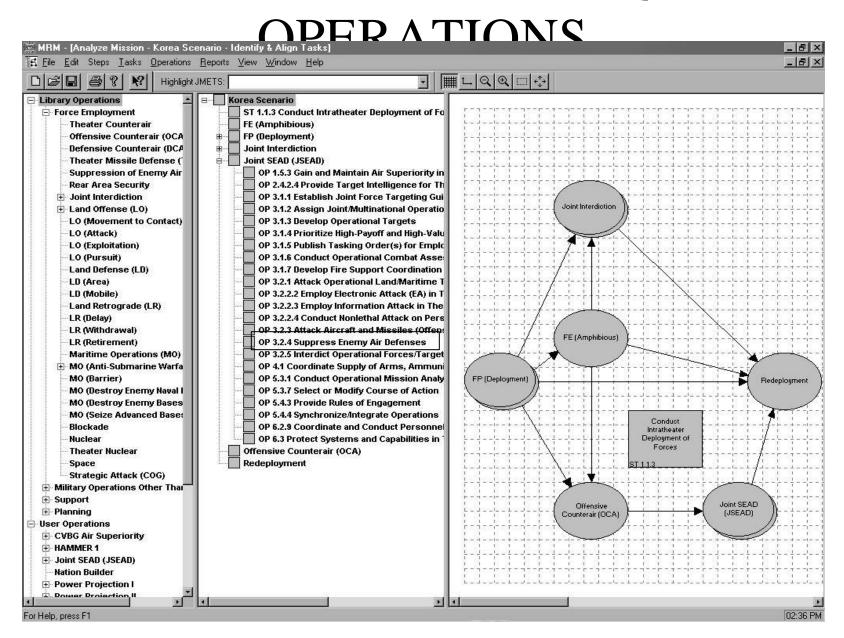
 Tasks are the fundamental building blocks of missions, and are executed by specific units or organizations.



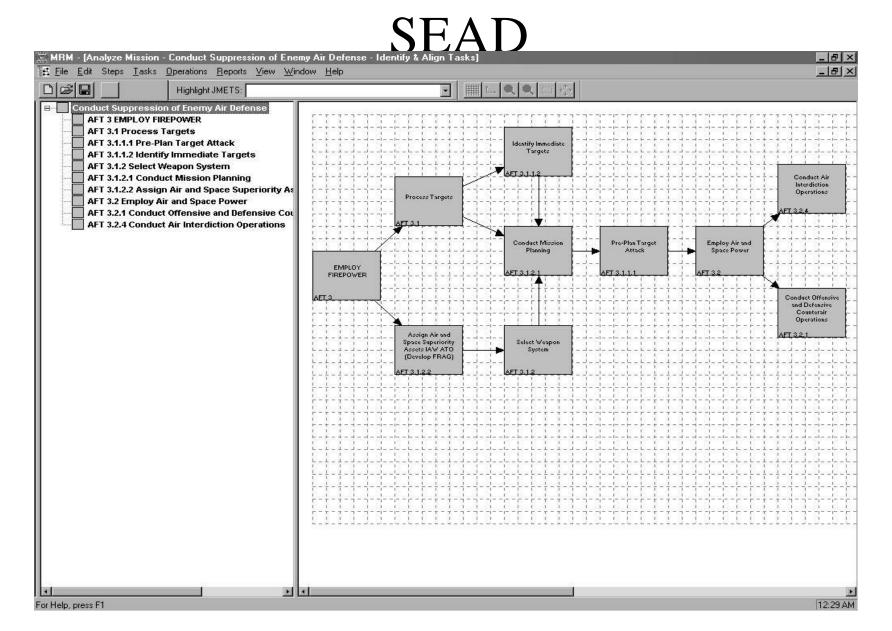
MISSION THREAD



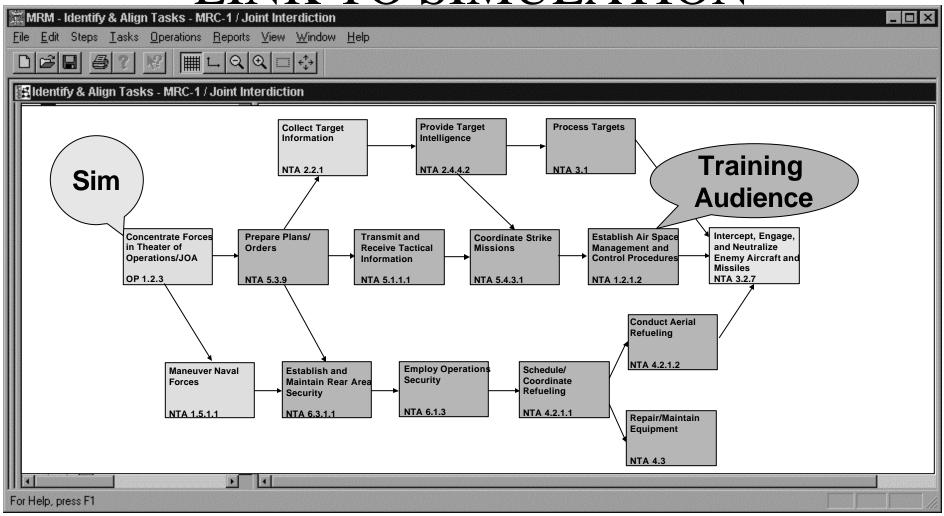
ANALYZE MISSION - SEQUENCE



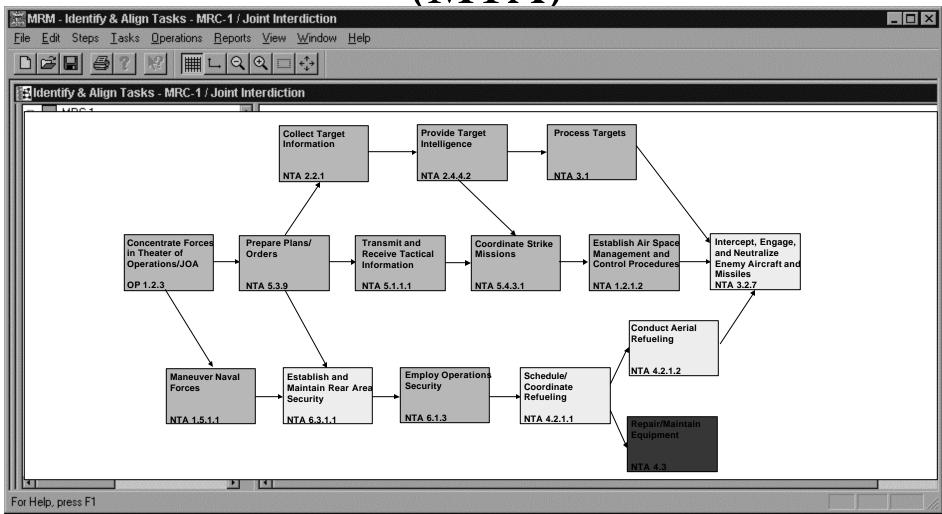
ANALYZE OPERATIONS - CONDUCT



DESCRIBE EXERCISE SCENARIO & LINK TO SIMULATION

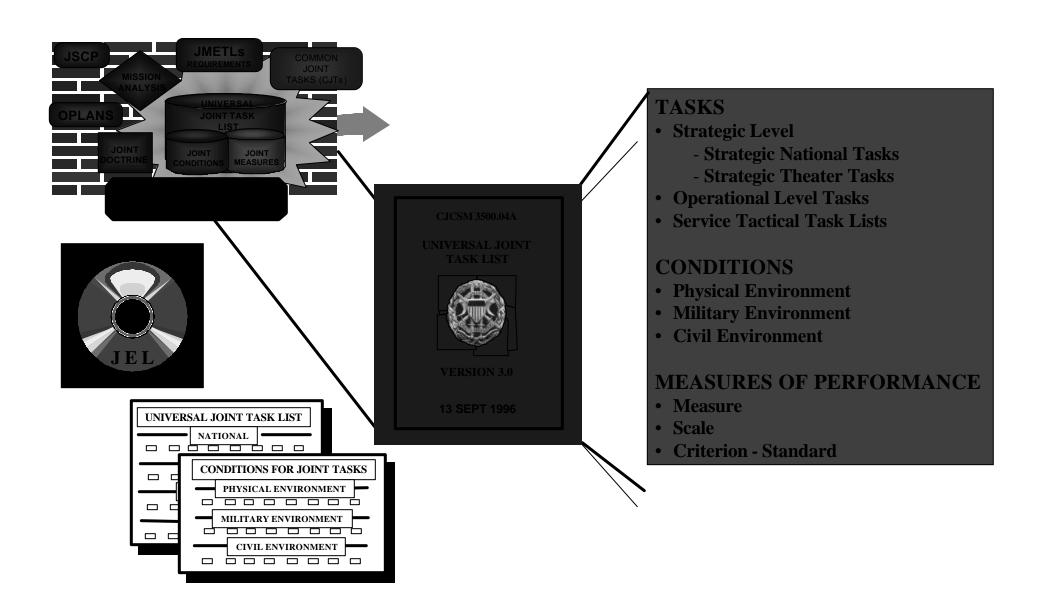


MISSION TRAINING ASSESSMENTS (MTA)



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(UJTL)



DEFINITION OF MEASURE

Measures distinguish among varying levels of task performance. More than one measure may be specified for any single task.

Task:

OP 2.2.1 Collect Information on Operational Situation

Measures:

| SCALE | MEASURE | |
|---------|---|--|
| Time | To retask collection asset | |
| Time | Since most current intel. info. was collected | |
| Percent | Of collection requirements filled | |
| Percent | Of collection requirements filled by multiple sources | |
| Percent | <u> </u> | |
| Percent | Of targets accurately located | |
| Percent | Of targets accurately identified | |

MISSION-BASED TASK STANDARDS

Standards express the degree to which (how well) a military organization or force must perform a task* under a specified set of conditions.

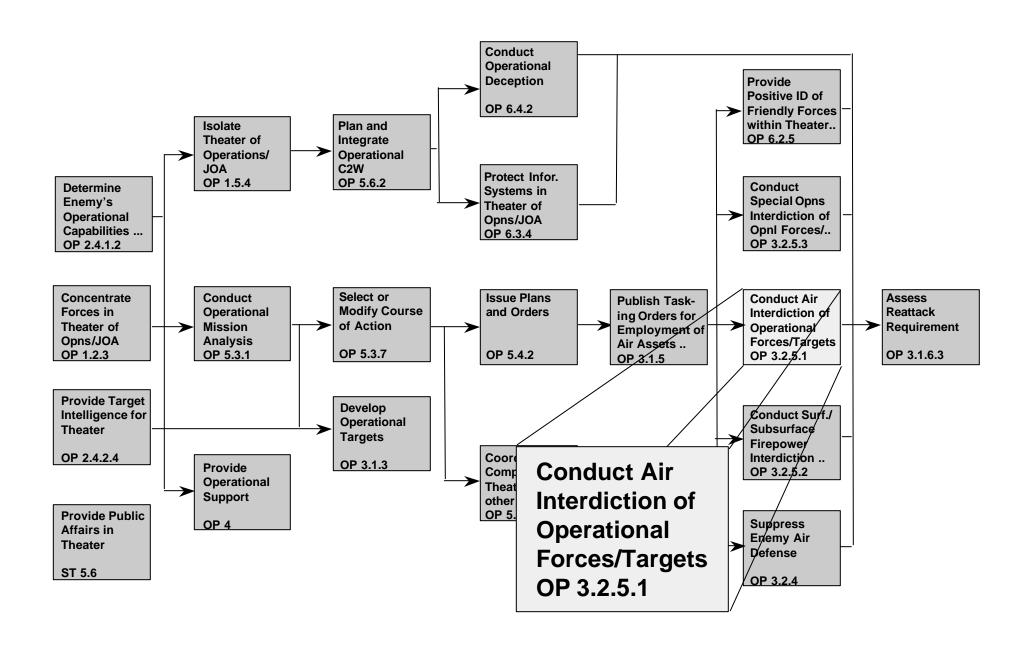
A criterion defines acceptable levels of performance for a measure and is often expressed as a minimum acceptable level of performance.

Standard:

| Criterion | <u>Scale</u> | <u>Measure</u> |
|-----------|--------------|---|
| 90 | Percent | of collection requirements filled |
| 4 | Hours | since most current intelligence information was collected |
| 85 | Percent | of targets accurately located |

^{*}e.g.; Collect Information on Operational Situation (OP2.2.1)

JOINT INTERDICTION TEMPLATE



REQUIREMENTS EXAMPLE

PERFORM TASK OF:

Conduct Air Interdiction of Operational Forces/Targets (OP 3.2.5.1) - to conduct air operations to destroy, neutralize, or delay the enemy's military potential.

UNDER CONDITIONS OF:

- ❖ <u>Negligible</u> <u>Light</u> (overcast night)(C 1.3.2.1) light available to illuminate objects from natural or manmade sources.
- Moderate Personnel Fatigue (C 2.2.4.6) degree to which personnel, due to lack of rest, are experiencing fatigue.
- ❖ Moderate Collateral Damage Potential (C 2.6.7) degree to which civilian population and structures (and friendly forces) are close to targets.

TO A STANDARD OF:

- **3** Hours to get ordnance on target after initiation of task
- 95 Percent of missions flown achieve desired target damage
- <5 Percent of engagements resulting in collateral damage</p>
- <2 Percent loss rate in first four days of combat</p>

CURRENT PERFORMANCE

PERFORM TASK OF:

Conduct Air Interdiction of Operational Forces/Targets (OP 3.2.5.1) - to conduct air operations to destroy, neutralize, or delay the enemy's military potential.

UNDER CONDITIONS OF:

- ❖ Negligible Light (overcast night)(C 1.3.2.1)
- **❖** Moderate Personnel Fatigue (C 2.2.4.6)
- **❖** Moderate Collateral Damage Potential (C 2.6.7)

TO A STANDARD OF:

- Hours to get ordnance on target after initiation of task
- 95 Percent of missions flown achieve desired target damage
- 10 Percent of engagements resulting in collateral damage
 - Percent loss rate in first four days of combat

ISSUES:

Improved defenses in 2015 will require new penetration capabilities for Air Interdiction Aircraft. Also, compressed ATO cycle will require faster a/c turnaround times.

ONE POSSIBLE SOLUTION

TASK: Conduct Air Interdiction of Operational Forces/Targets (OP 3.2.5.1)

PROPOSED SOLUTION: Advanced Aircraft

ANALYSIS CONDITIONS:

- ❖ C 1.3.2.1 Light <u>Negligible</u> (overcast night)
- **❖** C 2.2.4.6 Personnel Fatigue Moderate
- **❖** C 2.6.7 Collateral Damage Potential <u>Moderate</u>

PREDICTED PERFORMANCE:

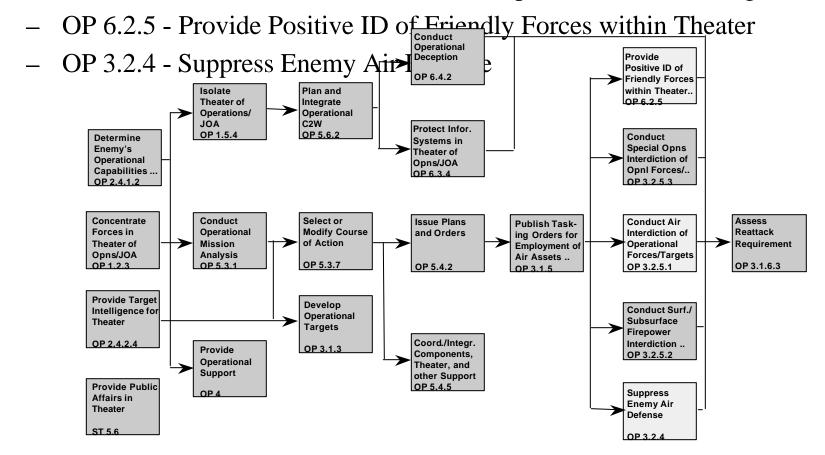
- Hours to get ordnance on target after initiation of task
- 95 Percent of missions flown achieve desired target damage
- 2 Percent of engagements resulting in collateral damage
- 1.5 Percent loss rate in first four days of combat

PERFORMANCE DISCUSSION:

- Stealth improved penetration
- Maintaining existing air and ground crew ratios limited turnaround times and TOT Responsiveness

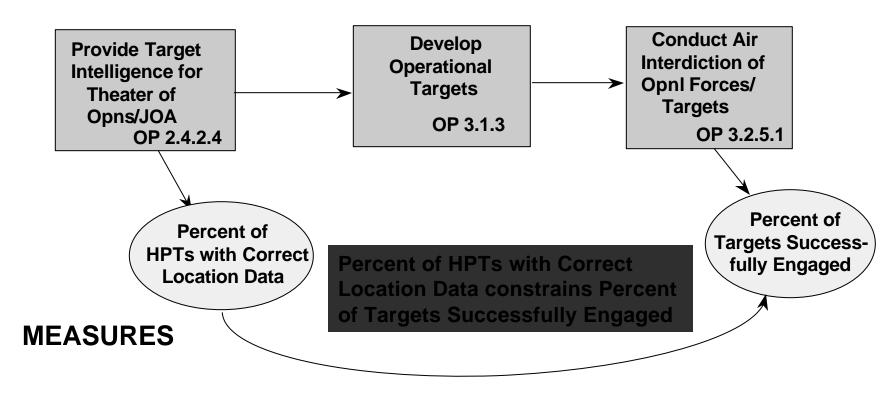
LINKING ACQUISITION OF NEW AIRCRAFT TO TASKS

- Improved mission success by enhancing performance of:
 - OP 3.2.5.1 Conduct Air Interdiction of Operational Forces/Targets



CAUSAL VIEW OF JOINT INTERDICTION

TASKS



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